

SERVICE MANUAL

PS115, PS116, PS220 Power Supplies

General Description

Size	5.7"H x 5.5"W x 10"D
Weight	9 lbs.
Operating Temperature	-30°C to +50°C
Storage Temperature	-55°C to +85°C

Specifications

Input Voltage	100 - 130 VAC
Fuse (input line)	2.5A
Output Voltage	13.6, ± 0.2 VDC
Output Current, min	6A
Line Regulation, min	0.2%
Load Regulation, min	0.2%
Ripple Noise, max	5mV p-p

INSTALLATION

1. Mount unit to a solid surface using number 8 screws.
2. Remove fiberglass cover from terminal strip and connect cables as indicated.
 - a. 100 to 130 VAC input cable should be connected to pins 1 and 2.
 - b. 13.6 VDC output cable should be connected to pins 5 and 6.
 - c. To assure full output without cable loss, use 14 gauge wire to connect the output to the load. For cable runs in excess of 12 feet, larger wire is recommended.
3. Replace terminal strip cover to prevent inadvertant short circuiting.

12/13/79

CIRCUIT THEORY (refer to schematic, Figure 1)

1. The ac input voltage to the PS115 is applied through a 2.5 amp fuse to the primary of a heavy duty transformer. The input is zener protected against overvoltage by CR4.
2. The transformer output is applied through a full wave bridge rectifier and filter to points A and B. From there, the positive line is routed through two pass elements Q1 and Q2 to the output. A voltage regulator circuit controls the pass elements and they in turn control the output.
3. Voltage Regulator
 - a. The voltage regulator is the heart of the PS115 power supply, holding the output voltage constant for wide variations in line voltage or load conditions. The basic regulator consists of two dc amplifiers QA1 and QA2 plus the pass element driver, Q3.
 - b. The regulator control is accomplished by differentially comparing the voltage across the divider R13, R14 and R15 applied to pin 2 of QA2 with the reference voltage applied to pin 3 of QA2. The reference voltage (5.6V) is taken from the zener ZR2 which is supplied a 1mA constant current by Q6 and R12. The output (pin 6) of QA2 supplies the proper current to Q3 which in turn supplies Q1 and Q2 with the result that the output remains at 13.6V independent of load. R14 is factory selected to set the output to $13.6 \pm 0.2V$.
4. Current Limiter
 - a. Current limiting, for short circuit protection, is accomplished by QA1 and Q4 acting as a limiter for drive to Q3.
 - b. A 1mA constant current through R14 supplies a constant 430mV to one input (pin 3) of QA1. This is compared to the voltage drop across R1, R2 and R3 which is fed back to the other input (pin 2) of QA1. When the voltage drop across R1, R2 and R3 is less than the drop across R17, (load currents less than 6.5A), the output of QA2 will be low and Q4 will be off having no affect on current out of QA2 to Q3. However, when the voltage drop across R1, R2 and R3 exceeds the drop across R17, QA1 output goes high turning on Q4 which begins clamping QA2 output and limits drive to Q3. This reduces the output voltage of the power supply to restrict output current to a safe power level.

5. Foldback Circuit

The foldback circuit affords short circuit protection and improved current limiting. A sample of the output voltage is applied to Q8 through R23. In addition, R22 provides a fixed current to Q8. Q7 and Q8 being connected in a current sharing mode will sink equal currents under normal operating conditions. The sum of these two currents will be 1mA when the output voltage is 13.6V. If the output voltage drops due to overload, the unbalance will cause Q7 to turn on Q4 and Q4 pulling drive from Q3 and inhibiting output current to a safe level. A short-circuit output will permit less than 2 amps of current flow.

6. Overvoltage Protection

CR3 is a 33 volt zener connected to protect all components in the regulator/limiter circuit from static overvoltage.

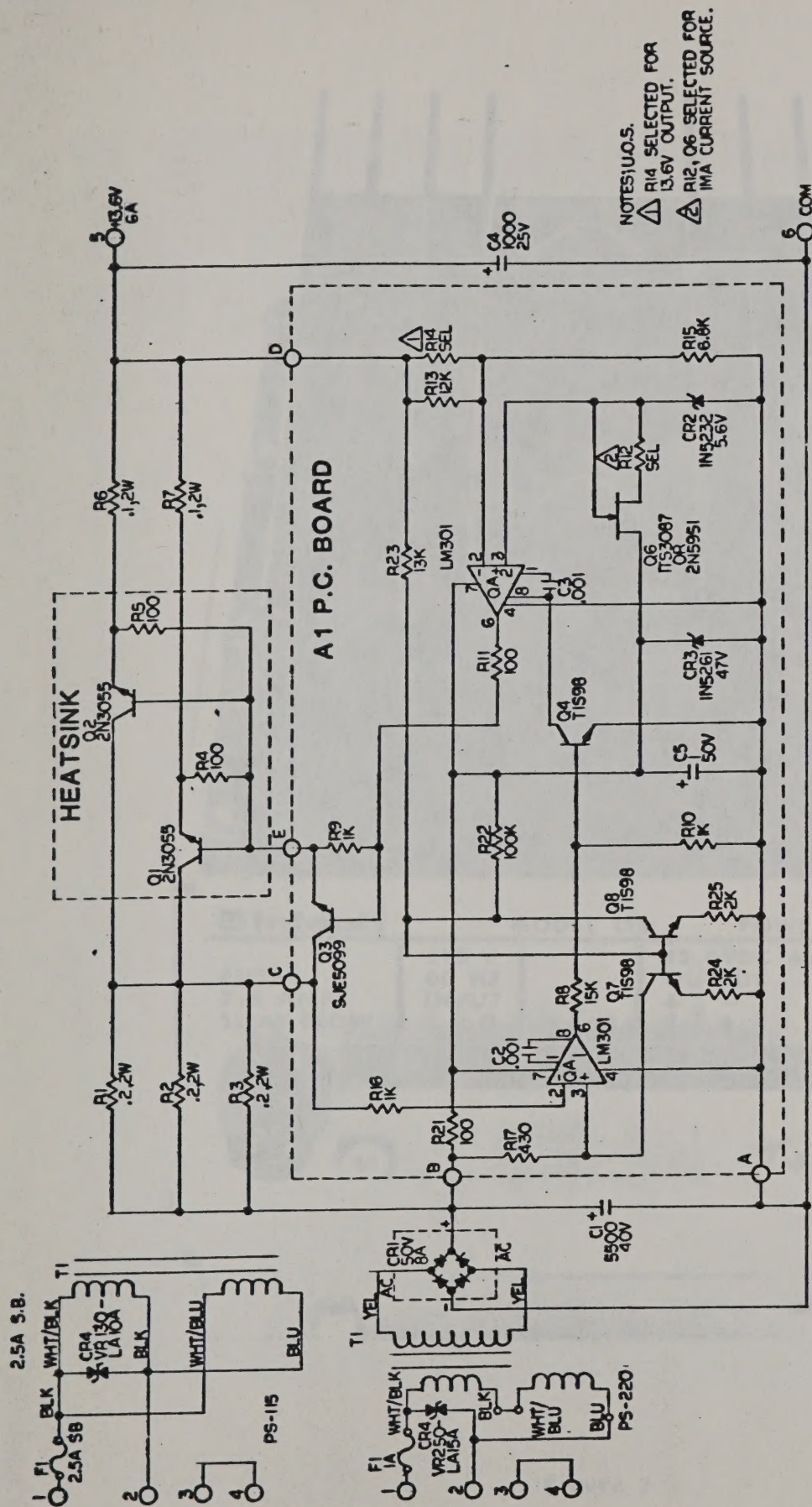


Figure 1
PS115 Power Supply Schematic

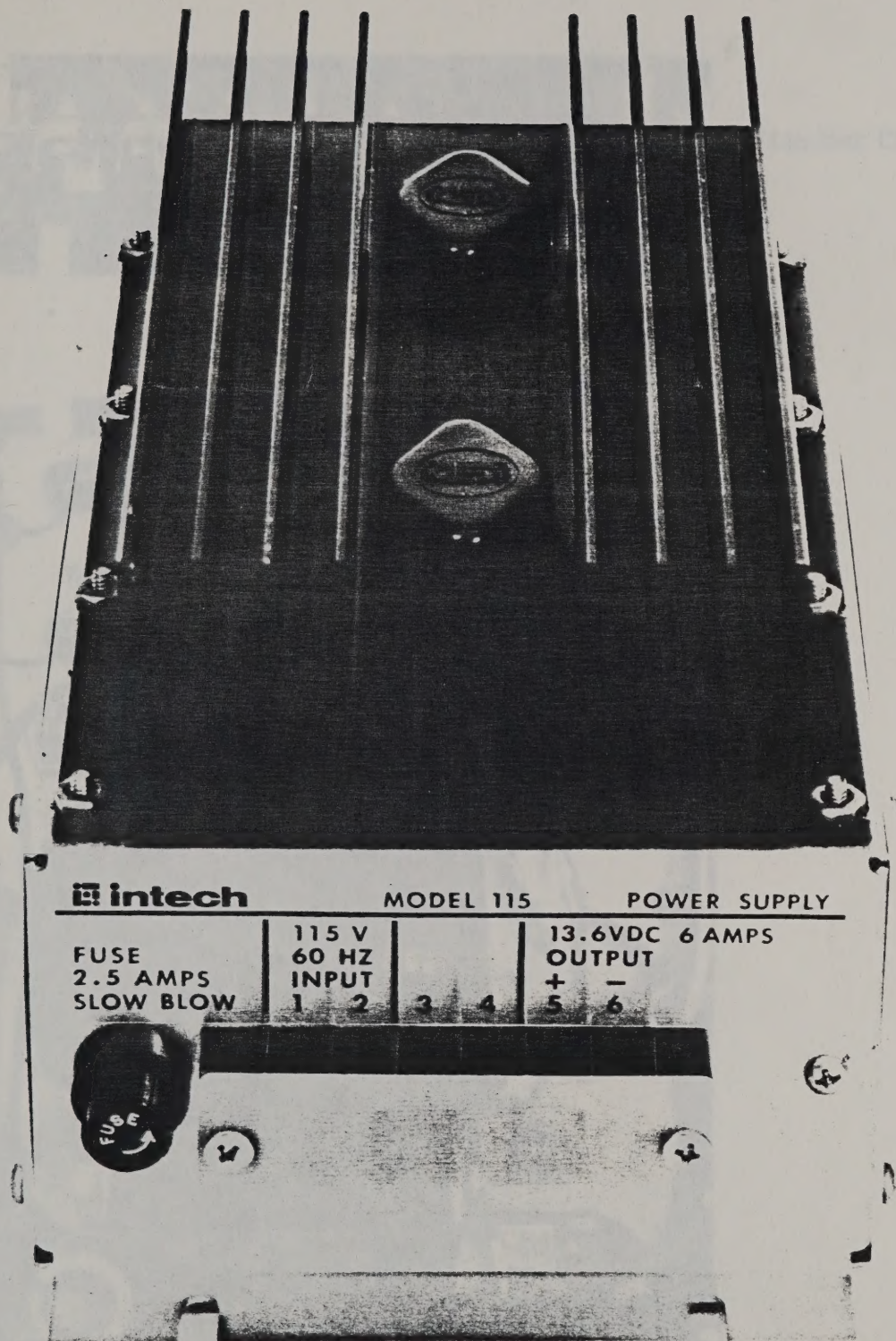


Figure 2

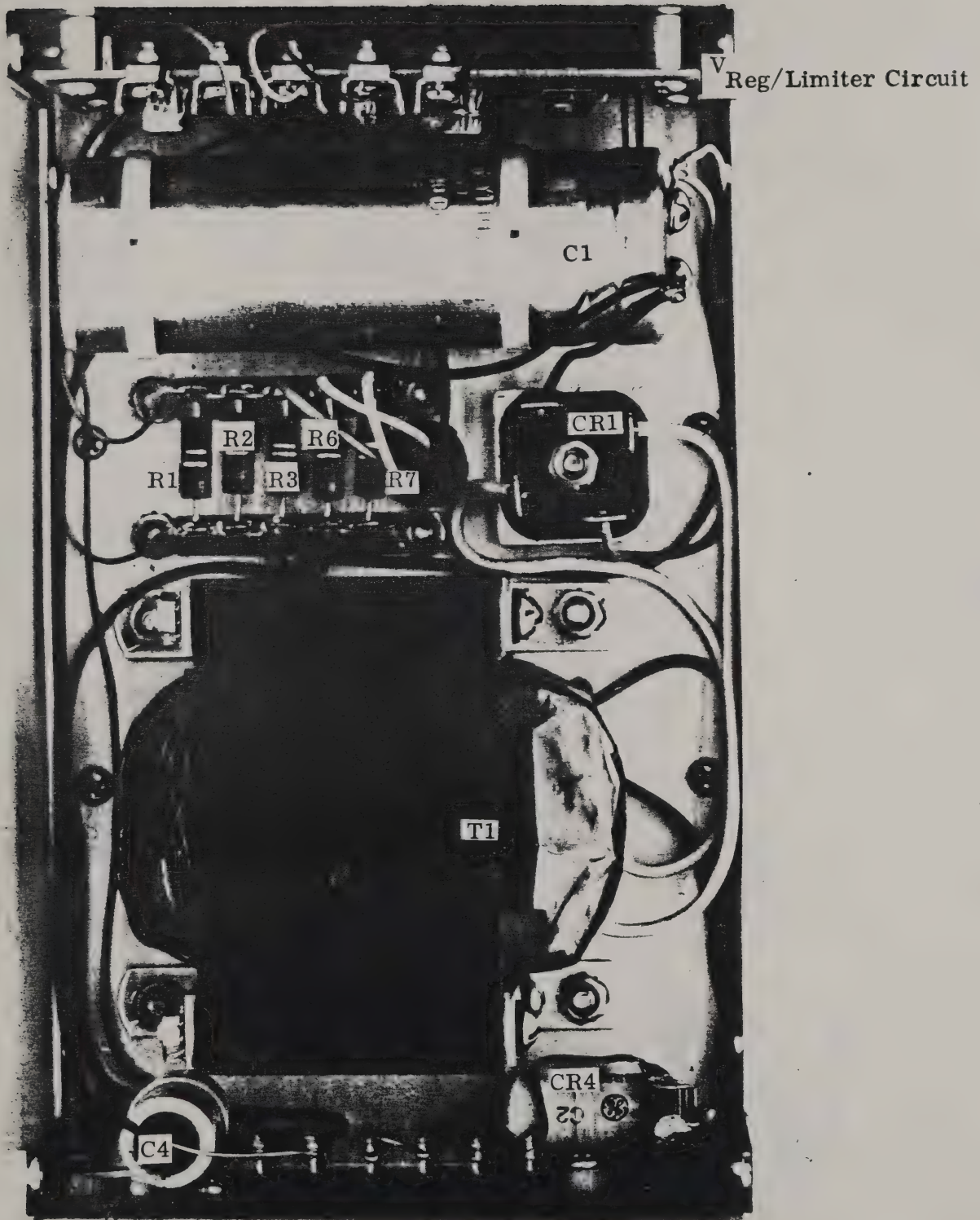


Figure 4

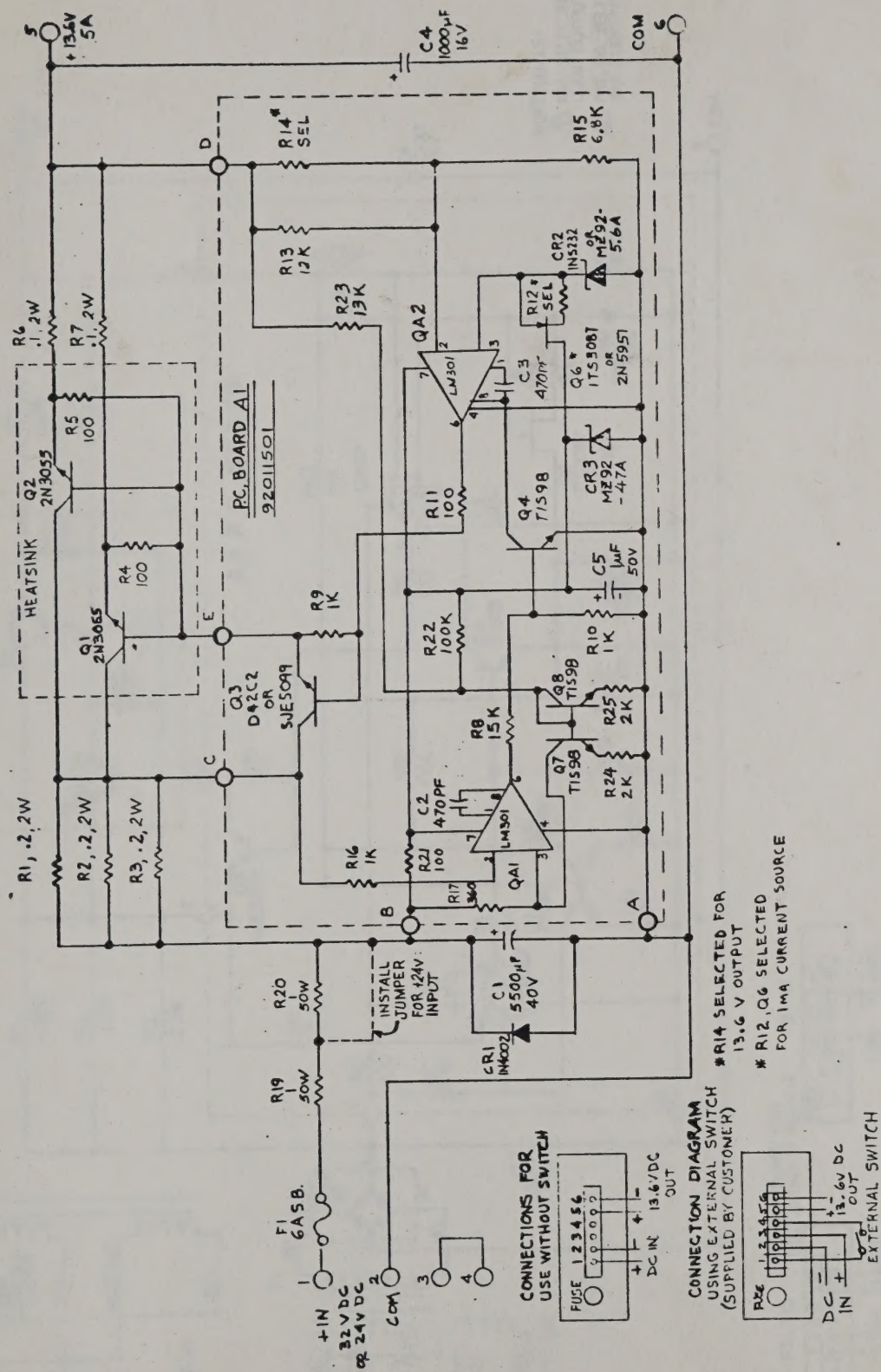


Figure 5
PS116 Power Supply Schematic

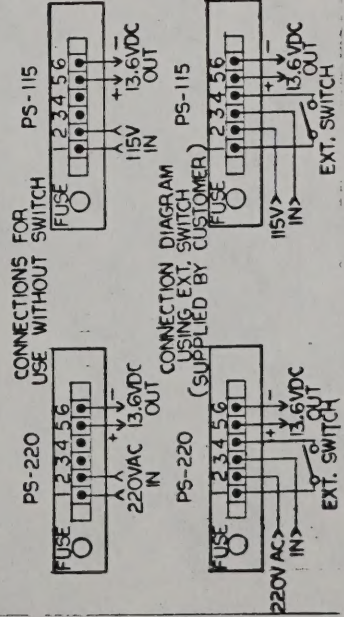
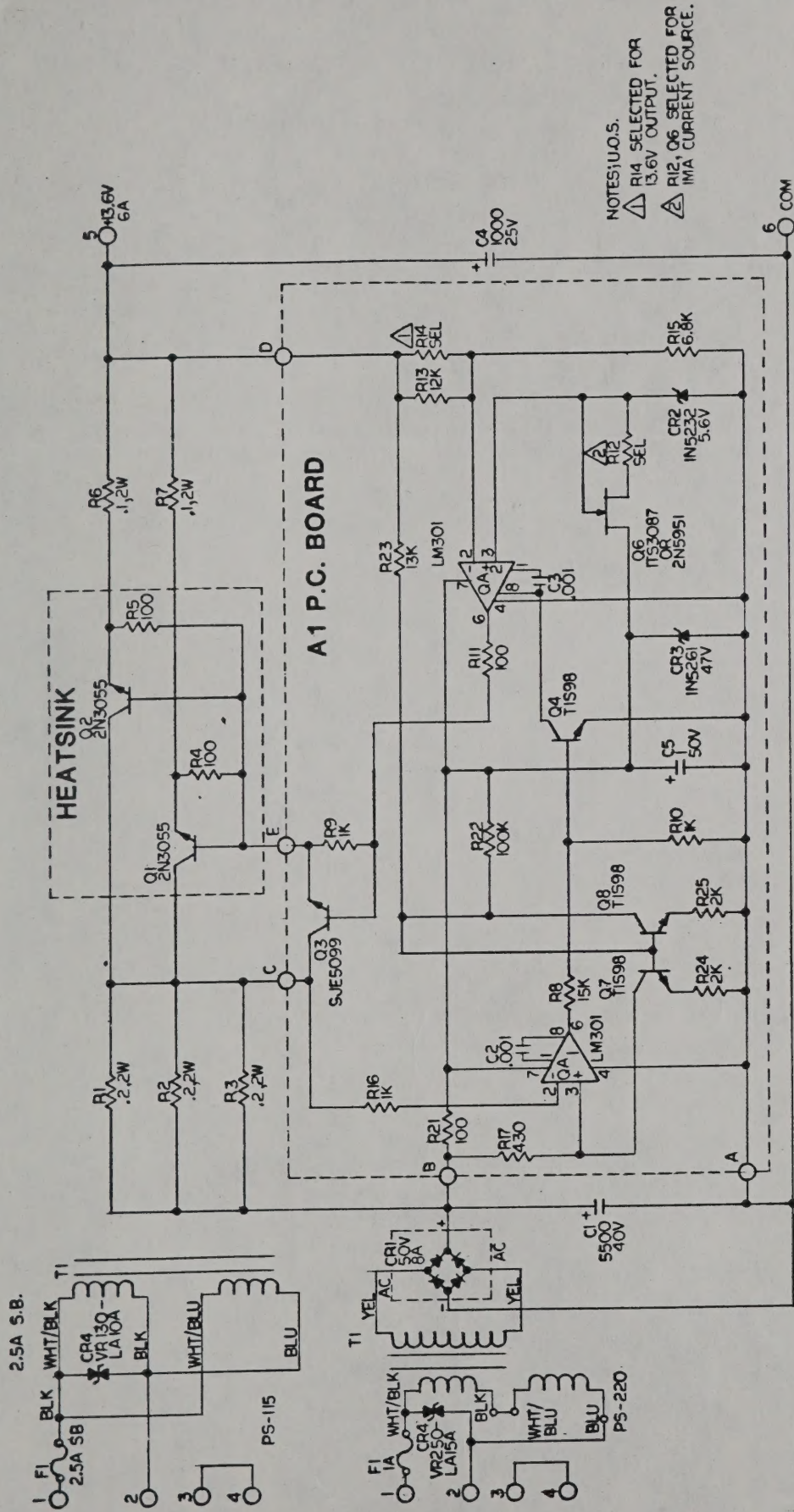


Figure 6
PS220 Power Supply Schematic

